Space Weather Forecast

Issued on Sunday, 16 July 2023 at 13:04 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout G1-G2/Moderate Likely Storms Day 2 (17 July), and possible Day 3 (18 Jul).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate, with only one short-duration M1 flare observed at 16/0826 UTC from the northeast quadrant. There are currently up to eight sunspot regions on the visible disc, two of which are rather large. One is in the southwest quadrant while the other one is in the northeast. Both are magnetically complex, with a small delta spot, but appear to have somewhat stabilised in the last 12 hours, with an absence of notable flares.

Several coronal mass ejections (CME) were observed leaving the sun over the past 24 hours, the largest and fastest originating from a region located well beyond the western horizon. A filament eruption was observed around 16/0830 UTC, originating from the northwest quadrant (just south of a coronal hole region). It may be Earth-directed but there is currently not enough satellite imagery to analyse it. The most recent CME originated from one of the two large regions (the one in the southwest quadrant) around 16/0845 UTC but it is not considered to be Earth-directed.

Solar Wind / Geomagnetic Activity: The solar wind was suggestive of a slow regime. The solar wind speed was steady and slowly declining from 410 to 350km/s, with below average particles within it. The total magnetic field (IMF), Bt, was largely weak with only small variations along the important north-south component. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) became enhanced after 15/2050 UTC, most likely associated to a long duration flare that was observed shortly before. The flux rose above the S1 threshold between 16/0630-0910 UTC, reaching a peak of 18pfu at 16/0735 UTC, before slowly coming back down during the following hours.

Solar Activity: Moderate activity is likely, with a slight chance of Strong flares. These are most likely from the two largest regions on the disc.

Solar Wind / Geomagnetic Activity: Earth is likely to see a CME arrive on day 2 (17 Jul) from the combined common-class flare and filament eruption that occurred on the 14 Jul. The strength of any impact is low confidence, due to uncertainties about the amount of any material in the CME, along with limited imagery for analysis, however this is currently expected to arrive 17/1400 +/- 10 hours. Otherwise solar winds are likely to ease towards background day 1 (16 Jul), and again once any CME influence subsides later day 3 (18 Jul). There is a slight chance of a small enhancement from the arrival of fast winds from a coronal hole later day 4 (19 Jul). Mainly Quiet geomagnetic activity is expected to become Active to G2 Moderate storm during the second half of day 2 (17 Jul). These conditions gradually easing day 3 (18 Jul) to be mainly Quiet by day 4 (18 Jul), however there is a slight chance of activity rising again to Unsettled to

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Active.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, but there is a slight chance of reaching the S1/Minor Storm threshold through the period, should any large X-ray flares occur. An increase in observed count rates may also occur just ahead of the CME arrival expected on day 2 (17 Jul)

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	60	40	5
Strong	G3	No	1	20	10	1
Severe	G4	No	1	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	30	20	10	10
Very Active	≥ S3 *	No	5	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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